No. 848,686. PATENTED APR. 2, 1907.

F. H. RICHARDS.

MECHANICAL MOVEMENT.

APPLICATION FILED APR. 23, 1900. RENEWED JUNE 9, 1903.

3 SHEETS—SHEET 1.

Fig. 1.

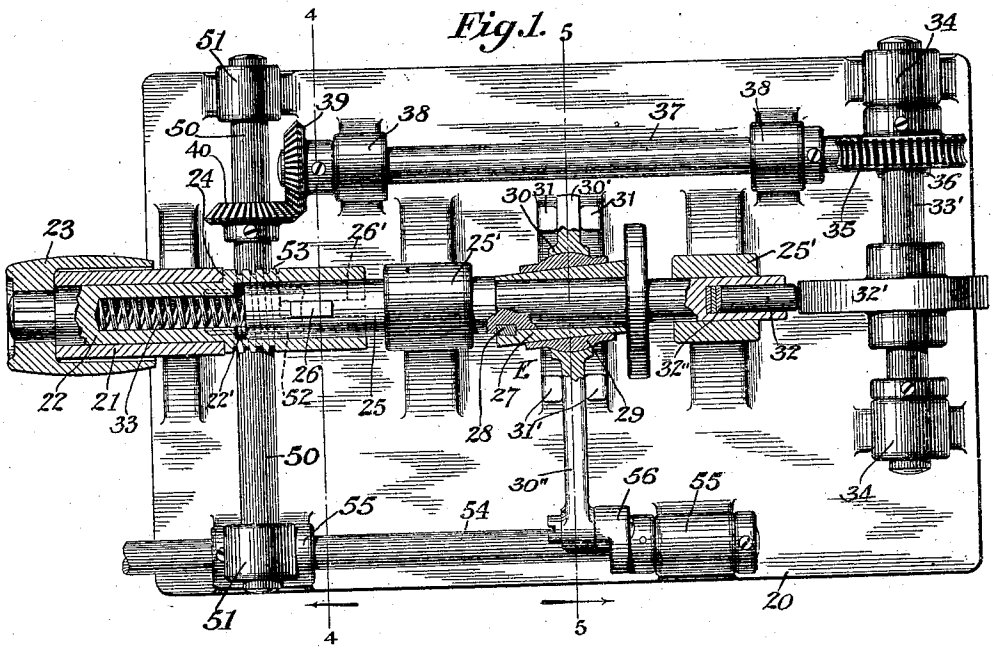
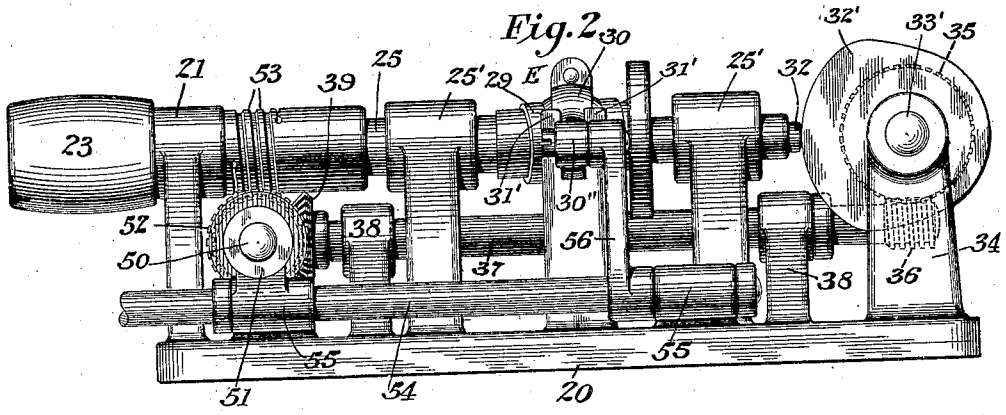


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

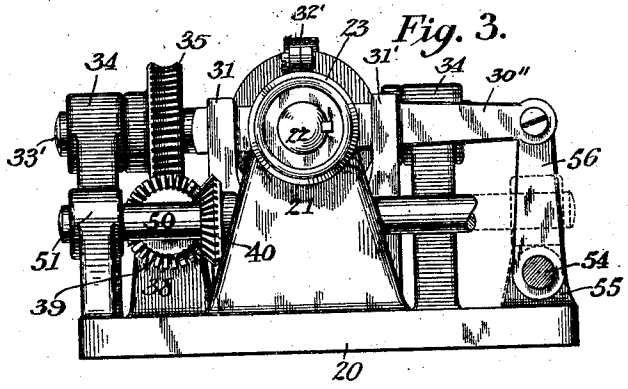


Fig. 4.

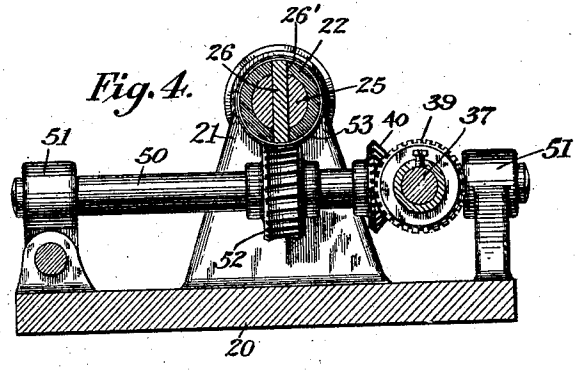
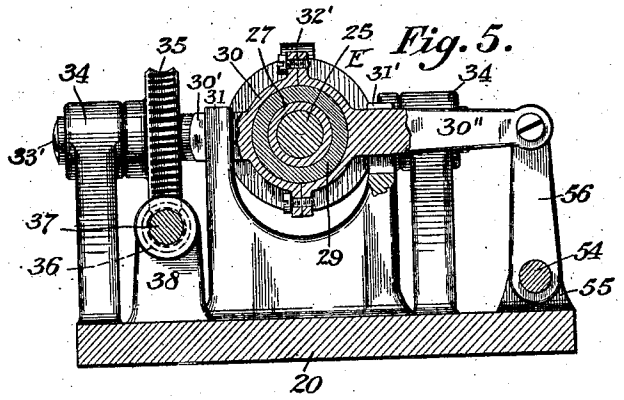


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

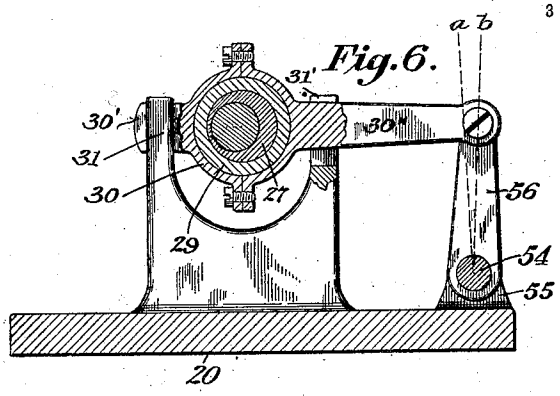


Fig. 7.

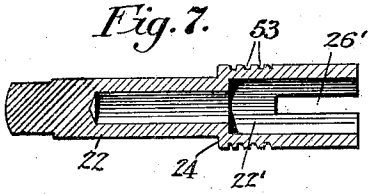


Fig. 8.

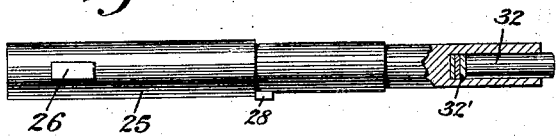


Fig. 10.

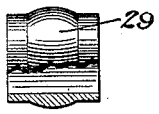


Fig. 9.

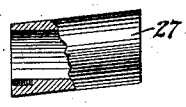
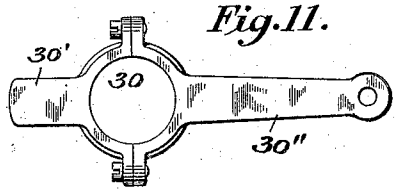


Fig. 11.



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UNITED STATES PATENT OFFICE.

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MECHANICAL MOVEMENT.

No. 848,686. Specification of Letters Patent. Patented April 2, 1907.

Application filed April 23, 1900. Renewed June 9, 1903. Serial No. 160,774.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

This invention relates to mechanical movements, and more especially to mechanism for converting a rotary movement of a driving member into a variable reciprocating movement of a driven member.

My invention has for one of its objects improvements in the device whereby such variable movement is effected, this device being in this case a variable-throw eccentric controlled by the driving member.

Another object of my invention is the provision of means whereby the throw of the eccentric may be so controlled by the driving member as to be periodically and automatically varied in a predetermined manner, and by means of this eccentric a constant rotary movement of the driving member may be converted into a reciprocatory movement of the driven member, the throw of which may be varied periodically, as required, said driven member being in the present organization a rock-shaft having a variable rocking movement.

This mechanism may be employed in apparatus for setting rivets in rapid succession and wherein the riveting operation will be intermittently suspended during the performance of some other and incidental operation—as, for instance, during a feed movement. Of course it may be used in connection with other metal-working machines wherein there will be a rapid working interrupted to permit some other movement—as, for instance, a feed movement.

My invention furthermore includes as one of its features certain improvements in the organization of a changeable-throw eccentric for which Letters Patent No. 540,843 was granted to me on June 11, 1895, and to which reference may be had.

In the accompanying drawings, Figure 1 is a sectional plan of a mechanical movement embodying my invention. Fig. 2 is a front view of the same. Fig. 3 is an end view looking from the left in Fig. 2. Fig. 4 is a transverse section on line 4 4, Fig. 1. Fig. 5 is a transverse section on line 5 5, Fig. 1, illustrating the eccentric in its position of minimum throw. Fig. 6 is a similar section showing the eccentric in its position of maximum throw; and Figs. 7 to 11, inclusive, are detail views of some of the parts of the mechanism.

The various component elements of a mechanism organized in accordance with my invention are shown in the drawings as mounted on a suitable base 20, having near one end thereof a bearing 21, in which the main driving member (shown at 22) may be journaled. The driving member 22 consists in the present instance of a shaft carrying on one end thereof a pulley 23, to which rotary movement may be imparted from any suitable source and held against longitudinal movement by a shoulder 24 and the pulley 23, disposed at opposite ends of the bearing 21. The shaft 22 may be recessed, as shown at 22′, Figs. 1 and 7, to receive one end of a shaft 25, which is longitudinally movable in bearings 25′ and which preferably carries a key 26, seated in a slot 26′ in one end of the shaft 22, so as to move in unison with the latter, while said shaft may reciprocate in the slot 22′, as will be evident.

The device for converting the rotary movement of the driving member into a variable reciprocating movement of a driven member consists in this instance of a variable-throw eccentric (designated in a general way by E) having an eccentric member 27, the working face of which is oblique to the axis of the shaft 25, on which it may be secured by a key 28.

Journaled on the member 27 is an independently-rotatable bearing member 29, the outer surface of which is spherical and engages the correspondingly-formed inner face of an eccentric-strap 30, which in the present instance is guided by a projection 30′, working between a pair of abutments 31, while a similar pair of abutments 31′ may serve to guide the eccentric-rod 30″ at a point diametrically opposite to the projection 30′. If the eccentric-strap is held against lateral movement in the manner described, the eccentric member 27 is mounted for longitudinal reciprocation through the strap, and in the present instance I prefer to secure the said eccentric to the reciprocable shaft 25, the device for effecting such movement being controlled in this instance by the rotary movement of the driving member.

Various means may be employed for shift-

ing the eccentric in the required manner, the means shown in the drawings including a suitable cam, such as 32′, which is in contact with a thrust-pin 32, loosely held in the end of the shaft 25 and resting with its inner end against a washer 32″ for taking up wear, while a spring, such as 33, may serve to force the shaft 25 toward the right, as seen in Fig. 1, and into contact with the cam. The shape of this cam will evidently control the position of the eccentric relatively to the strap, and hence the throw thereof. The cam is in the present instance under the control of the driving member, it being mounted on a shaft 33′, journaled in bearings 34 and carrying a worm-wheel 35, which is engaged by a worm 36 on a shaft 37. At its ends said shaft 37 is journaled in bearings 38, and it may have a bevel-gear, such as 39, meshing with a similar gear 40 on a shaft 50, which is journaled in bearings 51 and has mounted thereon a worm-gear 52, engaged by worm-threads 53 on the driving member 22. It will therefore be seen that the rotation of said driving-shaft 22 will result in rotating the cam 31 at a greatly reduced rate of speed, which may of course be varied as desired by substituting other intermediate mechanism for the one shown.

As above stated, the primary object of the present invention is to convert a rotary movement of the driving member into a variable reciprocating movement of the driven member, and it has been shown that the eccentric-rod 30″ will have such a movement. In the present instance this reciprocatory movement of the eccentric-rod is made use of for effecting a rocking movement of the driven member, said rocking movement being of course varied in a manner similar to the reciprocating movement. The driven member is herein shown as a rock-shaft 54, journaled in suitable bearings 55 and having an arm 56, the free end of which is pivotally secured to the eccentric-rod 30″.

In Figs. 1 and 5 the eccentric 27 is shown as being in a position in which the axis of the shaft 25 coincides with the axis of the opening through the strap, the oblique axis of the member 27 intersecting this common axis on the longitudinal center line of the strap. Thus situated the eccentric is at its minimum throw, while in Fig. 6 the eccentric is shown shifted to the right as seen in Fig. 1 into a position in which it will have its maximum stroke, the rotation of the eccentric resulting in a rocking movement of the shaft varying from a minimum to a maximum with the changing position of the eccentric, the latter stroke being indicated by the lines *a b*, Fig. 6. It will of course be understood that when said eccentric 27 is shifted toward the left as seen in Fig. 1 the eccentric will be in a position diametrically opposite to that shown in Fig. 6.

Having described my invention, I claim—

1. The combination with a rotatable shaft, of a variable-throw eccentric mounted thereon, and eccentric means for varying the throw of the eccentric according to a predetermined sequence and relation which is independent of any change in the speed of the shaft.

2. The combination with a rotatable shaft and with a variable-throw eccentric mounted thereon, of an eccentric automatic throw-changing mechanism controlling the operation of the eccentric independently of any change in the speed of said shaft.

3. The combination, with a rotatable shaft and with a variable-throw eccentric mounted thereon, of an automatic throw-varying device controlled by said shaft and controlling the operation of the eccentric independently of any change in the speed of said shaft.

4. The combination, with a rotatable shaft and with a variable-throw eccentric mounted thereon, of a cam for periodically varying the throw of the eccentric in a predetermined manner.

5. The combination, with a rotatable shaft and with a variable-throw eccentric mounted thereon, of a cam controlled by said shaft and operative for varying the throw of the eccentric.

6. The combination, with a rotatable shaft and with a variable-throw eccentric mounted thereon, of an eccentric-strap, one of said eccentric members being reciprocable relatively to the other, and means controlled by the shaft for operating said reciprocable member of the eccentric according to a predetermined sequence and relation which is independent of any change in the speed of said shaft.

7. The combination, with a rotatable shaft and with an eccentric mounted thereon and reciprocable through its strap, of an eccentric-strap, and means controlled by the shaft for reciprocating said eccentric according to a predetermined sequence and relation which is independent of any change in the speed of said shaft.

8. The combination, with a rotatable shaft mounted for reciprocation and with an eccentric carried thereon and reciprocable through its strap, of an eccentric-strap, and means controlled by the rotation of the shaft for reciprocating said shaft and the eccentric in a predetermined timing.

9. The combination, with a rotatable shaft mounted for reciprocation, and with an eccentric mounted thereon for longitudinal movement through its strap, of an eccentric-strap; a cam controlled by the rotation of the shaft for reciprocating said shaft and eccentric in one direction; and means for returning

said shaft and eccentric to their normal longitudinal positions.

10. The combination, with a driving member and with a reciprocatory shaft rotatable in unison therewith, of an eccentric mounted on said shaft and reciprocable through its strap; an eccentric-strap; and means operable by the driving member for reciprocating said shaft.

11. The combination, with a driving member and a driven member, of a variable-throw eccentric controlled by the driving member and operative for imparting a variable movement to said driven member having a predetermined sequence and relation which is independent of any change in the speed of the driving member.

12. The combination, with a driving member and an oscillatory driven member, of a variable-throw eccentric controlled by the driving member and operative for imparting a variable rocking movement to said driven member having a predetermined sequence and relation which is independent of any change in the speed of the driving member.

13. The combination, with a driving member and a driven member, of a variable-throw eccentric controlled by said driving member and operative for imparting a variable movement to the driven member, and automatically-operative means for periodically changing the throw of the eccentric independent of any change of the speed in the driving member.

14. The combination, with a driving member and a driven member, of a variable-throw eccentric controlled by the driving member and operative for imparting a variable movement to said driven member, and mechanism controlled by said driving member for varying the throw of said eccentric independent of any change of the speed in the driving member.

15. The combination, with a driving member and a driven member, of a variable-throw eccentric mounted on the driving member and operative for imparting a variable movement to said driven member, and means controlled by said driving member for varying the throw of the eccentric independent of any change of the speed in the driving member.

16. The combination, with a driving member and with a rotatable shaft operated thereby and mounted for reciprocation, of a driven member; a variable-throw eccentric mounted on said shaft and reciprocable therewith through its strap and operative for imparting a variable movement to the driven member; an eccentric-strap; means for guiding said strap; and means controlled by the driving member for reciprocating said shaft and periodically changing the throw of the eccentric.

17. The combination, with a shaft, of an eccentric and an eccentric-strap, the former of which is mounted on, and has its working face oblique to the axis of, the shaft, one of said eccentric members being reciprocable relatively to the other; and an independently-movable bearing member interposed between the eccentric and strap and held against longitudinal movement in said strap.

18. The combination, with a shaft, of an eccentric and an eccentric-strap, the former of which is mounted on, and has its working face oblique to the axis of, the shaft, one of said eccentric members being reciprocable relatively to the other; and an independently-movable bearing member having a bore to fit the working face of the eccentric and having a spherical bearing-face coöperating with the inner bearing-face of the eccentric-strap.

19. The combination, with a shaft and with an eccentric mounted thereon and having its working face oblique to the axis of a shaft, both of said members being mounted for reciprocation through the strap, of an eccentric-strap; a bearing member having a bore to fit the working face of the eccentric and having a spherical bearing-face coöperating with the inner face of the strap; and means for guiding the strap and holding the same against lateral displacement.

20. The combination with a rotating shaft, of means for deriving a to-and-fro movement therefrom, and means operative thereon for varying such movement in a predetermined sequence and relation, which is independent of any change in the speed of the shaft.

21. The combination with a rotating shaft, of means for deriving a variable to-and-fro movement therefrom, and means for varying such movement in a predetermined sequence and relation independent of any change in the speed of the shaft.

22. The combination with a rotatable shaft, of means for deriving a variable to-and-fro movement therefrom, and means operative thereon independent of any change in the speed of the shaft for controlling such movement.

23. The combination with a rotatable shaft, of means for automatically deriving a to-and-fro movement therefrom, and means for variably controlling such movement in a predetermined sequence and relation.

24. The combination with a rotating shaft, of means for automatically deriving a variable to-and-fro movement therefrom, and means for automatically varying said movement in a predetermined sequence and relation.

25. The combination with a rotative shaft, of an element connected with the shaft for imparting a to-and-fro movement from the same, and automatic means for shifting the said element in the direction of the shaft-axis.

26. The combination with a rotating shaft, of an element connected with the shaft for

imparting a to-and-fro movement from the same, and means driven from the shaft for shifting the said element in the direction of the shaft-axis.

27. The combination with a rotating shaft, of an element connected with the shaft for imparting a to-and-fro movement from the same, and a cam for shifting the said element in the direction of the shaft-axis.

28. The combination with a shaft, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft and movable axially thereof, a movement-transmitter for the driver, a ball-and-socket connection between said driver and its movement-transmitter, and means for reciprocating the driver and driver-shaft axially of the latter.

29. The combination with a shaft, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft and movable axially thereof, a movement-transmitter for the driver, a ball-and-socket connection between said driver and its movement-transmitter, and a cam and spring for reciprocating the driver and driver-shaft axially of the latter.

30. The combination with a shaft, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft and movable axially thereof, a movement-transmitter for the driver, a ball-and-socket connection between said driver and its movement-transmitter, and a cam driven from the driven shaft and a spring for reciprocating the driver and driver-shaft axially of the latter.

31. The combination with a shaft provided with an axially-extending socket, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft and movable axially thereof in said socket, a movement-transmitter for the driver, a ball-and-socket connection between the driver and its movement-transmitter, and a cam and a spring in said socket for reciprocating the driver and the driver-shaft axially of the latter.

32. The combination with a shaft provided with an axially-extending socket, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft in said socket, a movement-transmitter for the driver, and movable axially thereof, a ball-and-socket connection between the driver and its movement-transmitter, a cam and a spring in said socket for reciprocating the driver and the driver-shaft axially of the latter, and gearing actuated from the driven shaft for rotating the cam.

33. The combination with a shaft provided with an axially-extending socket, of a variable-throw driver, a shaft for the driver rotating in unison with said former shaft and movable axially thereof in said socket, a movement-transmitter for the driver, a ball-and-socket connection between the driver and its movement-transmitter, a cam and a spring for reciprocating the driver and the driver-shaft axially of the latter, a pin extending from said driver-shaft and contacting with said cam, and gearing actuated from the driven shaft for rotating the cam.

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